

A NEW SPECIES OF DIMINUTIVE
ELEUTHERODACTYLUS (LEPTODACTYLIDAE)
FROM OAXACA, MEXICO

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Abstract.—*Eleutherodactylus polymniae* is described from the northern slopes of the Sierra Juárez, Oaxaca, México. It is a small species, with distinctively marked flanks and thighs, and has a vocal repertoire of at least four separate, distinct calls. This species is apparently a member of the *alfredi* group, and may exist sympatrically with *E. spatulatus*.

Resumen.—Se describe una nueva especie de rana, *Eleutherodactylus polymniae*, conocido del vertiente norteño de la Sierra Juárez, Oaxaca, México. Es una especie diminutiva, con manchas distintivas sobre la parte lateral del abdomen y sobre los muslos, y dispone de un repertorio vocal que consiste de por lo menos cuatro cantos separados y distintos. Aparentemente dicha especie es miembro del grupo *alfredi*, y posiblemente existe en simpatria con *E. spatulatus*.

The vegetation covering the northern slopes of the Sierra Juárez in Oaxaca comprises one of the most extensive tracts of cloud forest remaining in México. Within the last decade, however, agricultural clearings have steadily advanced up the hillsides so that most of the original forest below the 1200 m contour has been severely altered. Also the leeward (southern) side of the range is drier than the northern slopes, and is subject to periodic man-induced forest fires that have damaged the higher portions of the cloud forest. Previously, owing to the cold, wet environment and poor soils, the portion of the forest between about 1500 and 3000 m was almost uninhabited by humans. However, with the recent advent of hardwood logging, the entire forest is in danger of soon being irreversibly damaged with an associated loss of many species of animals.

The cloud forest of the Sierra Juárez harbors a remarkably diverse herpetofaunal assemblage containing many endemic species. Only one road traverses the region (Mexican Highway 175), and it has been primarily

along this road that biologists have made collections. Probably no other region of similar size in México has yielded more new species of amphibians and reptiles in the last few decades, nor remains so superficially known. A few of the species, by no means a complete listing, of recently described species that, so far as is known, are endemic to the region include *Pseudoeurycea juarezi* (Regal, 1966), *Hyla cyanomma* and *H. sabrina* (Caldwell, 1974), *H. echinata* (Duellman, 1962), *H. mixe* (Duellman, 1965), *Norops polyrhachis* (Smith, 1968), *Abronia mitchelli* (Campbell, 1982), *A. kailaina* (Good & Schwenk, 1985), *Barisia juarezi* (Karges & Wright, 1987), *Exiliboa placata* (Bogert, 1968), *Cryophis hallbergi* (Bogert & Duellman, 1963), and *Geophis duellmani* (Smith & Holland, 1969).

In the summer of 1983, we discovered yet another unknown anuran species in the Sierra Juárez. This frog inhabits steep slopes and is extremely difficult to collect. The remarkable voice of this species, in combination with its habitat, where a misstep by

anyone pursuing it might have disastrous consequences, moves us to name this frog

Eleutherodactylus polymniae, new species
Figs. 1–3

Holotype.—University of Texas at Arlington (UTA) A-12976 (original number, JAC 9007), an adult male, collected 0.8 km N Vista Hermosa, northern slopes of the Sierra Juárez, Oaxaca, México, at an elevation of 1420 m, 25 Jul 1983, J. A. Campbell, W. W. Lamar, and D. M. Hillis.

Paratype.—UTA A-23511, an adult topotypic male, taken by the same collectors, 17 Aug 1983.

Diagnosis.—A small species of *Eleutherodactylus* (SVL of largest male, 19.7 mm); possessing expanded digital pads, especially on the outer two fingers, which are between three and four times wider than the digits at their narrowest point; a relatively small tympanum, the horizontal distance across which is less than a third of the distance across the eye; and distinctive white markings extending anterodorsally across the flanks from the inguinal region. The species differs from all Mexican congeners in having four separate, distinct calls.

Description.—Dorsal outline of snout broadly rounded; snout profile in lateral view truncate; canthus rounded; choanae round except along the anterior edge which is straight owing to the shape of the lateral wings of the prevomers; vomerine teeth present, three or four teeth per fascicle; tongue ovoid, notched posteriorly; glottal disc large; vocal slits elongate, extending from a point about equal to midlength of tongue to the corner of the mouth; eyelids, dorsum, forearms, and shanks, with a few enlarged tubercles, otherwise skin of dorsum smooth, that of venter corrugate; tympanum small, dorsal margin of tympanic ring indistinct; no glands apparent in the axillary, lumbo-inguinal, or inguinal areas; second finger longer than first; finger and

toe discs expanded and truncate (emarginate in dorsal view), pads on outer fingers between three and four times wider than digit; a whitish nuptial thumb pad present; subarticular tubercles rounded and raised; supernumerary tubercles absent on digits; three rounded or oblong palmar tubercles; small calcar tubercles present; inner and outer tarsal folds absent, but several small tubercles along outer surface of tarsus, and a single tubercle along inner surface of tarsus; inner and outer metatarsal tubercles present, inner larger; several small tubercles on distal plantar surface, not extending posteriorly to level between metatarsal tubercles; webbing on hands and feet vestigial.

The dorsum is mostly greenish brown with some rust colored markings. Dark brown markings are present along the posterior margin of the nostrils and along the upper lip, with large spots below the eye and above the corner of the mouth. Dark brown markings also extend along the upper border of the tympanum and the scapular region of the dorsum. The inguinal region is bright white with two irregular white bars extending forward anterodorsally to about the midlength of the body (Fig. 1). The anterior and posterior surfaces of the thighs are patterned with sharply contrasting white and brown bars; the forearms, tibia, and dorsal surfaces of the thighs have moderately contrasting pale brown and darker brown bars. The throat and venter are pale with scattered black melanophores; the ventral surfaces of the thighs and the plantar surfaces are darker, with numerous melanophores.

The snout-vent length (SVL) is 19.7 mm; the head length, 8.2 mm; the head width, 8.1 mm; the horizontal distance across the eye, 2.8 mm; the distance from the eye to the tip of the snout, 3.6 mm; the distance from the eye to the nostril, 2.5 mm; the horizontal distance across the tympanum, 0.9 mm; the tibia length, 11.3 mm; and the distance from the proximal edge of the inner metatarsal tubercle to the distal tip of the fourth toe, 9.7 mm.



Fig. 1. *Eleutherodactylus polymniae*, new species, holotype, SVL 19.7 mm, UTA A-12976.

Variation.—The paratype (UTA A-23511) is similar to the holotype in most aspects of morphology, color, and pattern. Measurements for the paratype are as follows: SVL, 19.0 mm; head length, 7.9 mm; head width, 7.3 mm; horizontal distance across eye, 2.5 mm; eye to tip of snout, 3.4 mm; eye to nostril, 2.3 mm; horizontal distance across tympanum, 0.8 mm; tibia, 11.6 mm; and distance from proximal edge of inner metatarsal tubercle to distal tip of fourth toe, 9.5 mm.

Etymology.—The name *polymniae* is derived from *Polymnia*, also known as “she of the many hymns,” one of the Greek sirens that was believed to lure mariners to destruction by her singing.

Remarks.—In many respects (size, color, morphology) *E. polymniae* resembles certain members of the genera *Tomodactylus* and *Syrrhophus* (for reviews of these genera,

see Dixon 1957, and Lynch 1970a, respectively). It may be distinguished from species contained in these genera by the absence of lumbo-inguinal or inguinal glands, and by the failure of the plantar supernumerary tubercles to extend posteriorly to a level between the metatarsal tubercles. Most species of *Syrrhophus* and *Tomodactylus* also have supernumerary tubercles on the digits, and especially on the toes; in *E. polymniae* the digits lack supernumerary tubercles. *Eleutherodactylus polymniae* conforms to the diagnosis of the genus *Eleutherodactylus* provided by Lynch (1968).

Mexican and Guatemalan members of
the genus

Eleutherodactylus having widely expanded digital pads have been placed in the *alfredi* group (Lynch 1965, 1966, 1967a, b, c,



Fig. 2. Pattern of posterior surface of thighs in *Eleutherodactylus polymniae*, paratype, UTA A-23511.

1970b). Other than sharing distinctive digital pads, few characters have been reported to suggest that this group is monophyletic. Geographically, the group is relatively compact, with 11 species along the Atlantic coastal plain and versant from Tamaulipas, México, southward through much of the Yucatán Peninsula to the mountains of northern Guatemala. One species, *E. guereroensis*, is restricted to the Pacific versant, and another, *E. stuarti*, occurs on both the Atlantic and Pacific side of the Continental Divide (Fig. 4). Most species have extremely restricted montane distributions, and many are known from fewer than half a dozen specimens. *Eleutherodactylus alfredi* has a wide distribution, ranging from east-central Veracruz (Smith & Taylor 1948) to Tabasco (Lee 1980) and Piedras Negras, Guatemala (Duellman 1960, Stuart 1963). *Eleutherodactylus decoratus* occurs along the Atlantic slopes of the Sierra Madre Oriental from southern Tamaulipas to central Ve-

racruz (Martin 1958, Lynch 1967c). *Eleutherodactylus stuarti* ranges from western Chiapas (Johnson 1974, Johnson et al. 1976) into western Guatemala. *Eleutherodactylus xucanebi* occurs in the northern cloud forests of Guatemala and is the southernmost member of the group (Stuart 1941). With the possible exception of *E. polymniae* and *E. spatulatus*, no two members of the group are known to be sympatric with one another.

Males in this group of frogs range in size from *E. polymniae* (19.7 mm) to *E. guereroensis* (39.6 mm). Considerable sexual dimorphism exists and females usually attain from 1.3 to 1.4 times the SVL of males. The relative size of the tympanum is also usually sex dependent, being larger in the males of most species. The tympanum to eye ratio of all species in which the males are known is 0.62 or greater, except for *E. polymniae* and *E. spatulatus* which have ratios of 0.25–0.30 and 0.32, respectively. *Eleutherodactylus megalotympanum* was

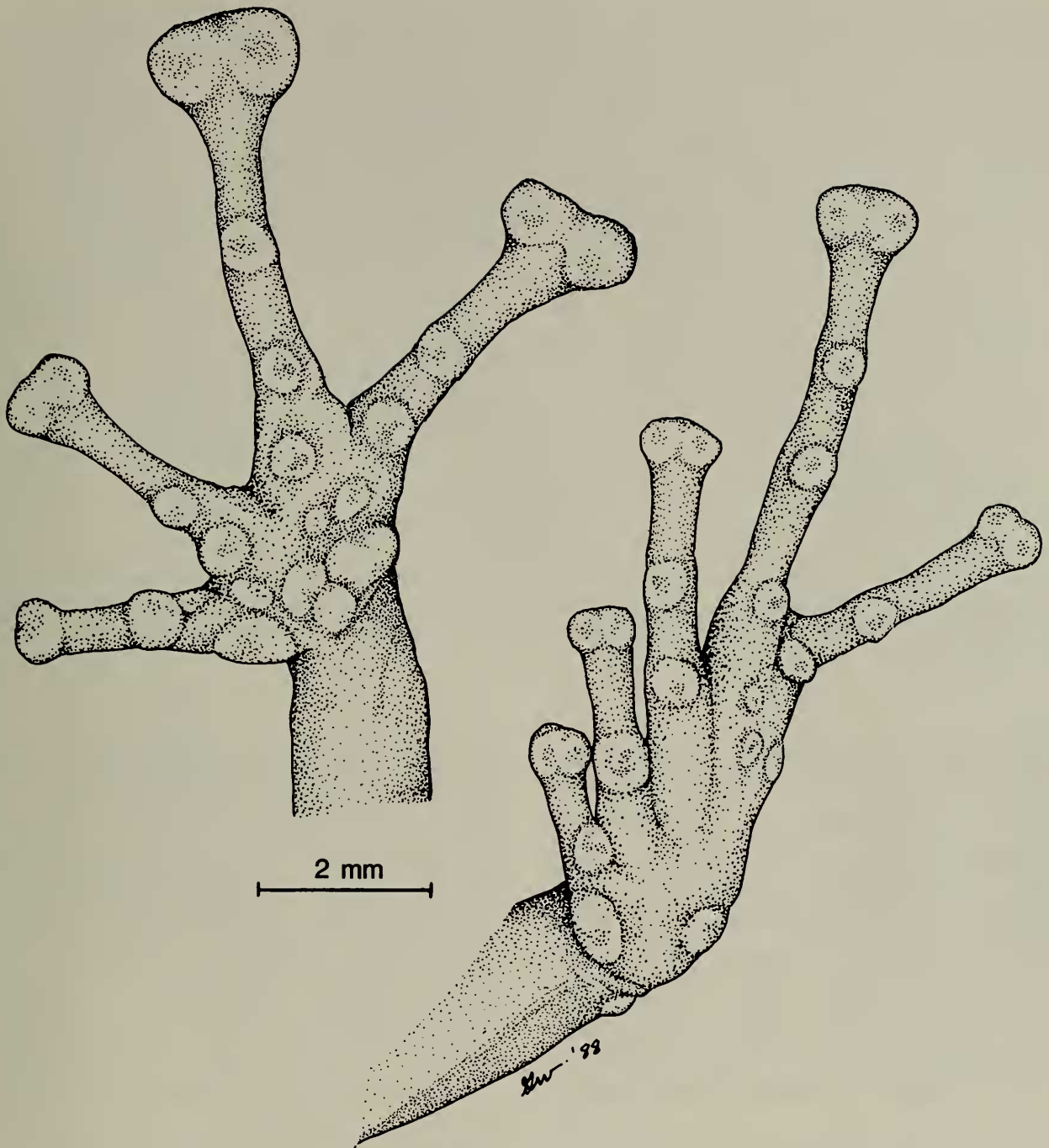


Fig. 3. Ventral aspects of hand and foot of *Eleutherodactylus polymniae*, holotype, UTA A-12976.

named in allusion to what was perceived to be the relatively large tympanum in females. However, the tympanum is not larger than that known in females of several other species. *Eleutherodactylus spatulatus* differs from other species in the *alfredi* group in that males have a slightly smaller tympanum than females. A large series of *E. decoratus* was reported to have little sexual dimorphism in the size of the tympanum (Martin 1958). The tarsal fold in this group

may be poorly to moderately developed or absent. The color pattern of the flank in most species is rather drab, being a pale yellow, cream, gray, or tan with irregular stippling or mottling. The specimens of *E. decoratus* that we have seen in life had a contrasting pattern of brown markings on a pale background, often with a narrow pale vertebral stripe. *Eleutherodactylus polymniae* has the most distinctive markings in the *alfredi* group, with a large irregular white

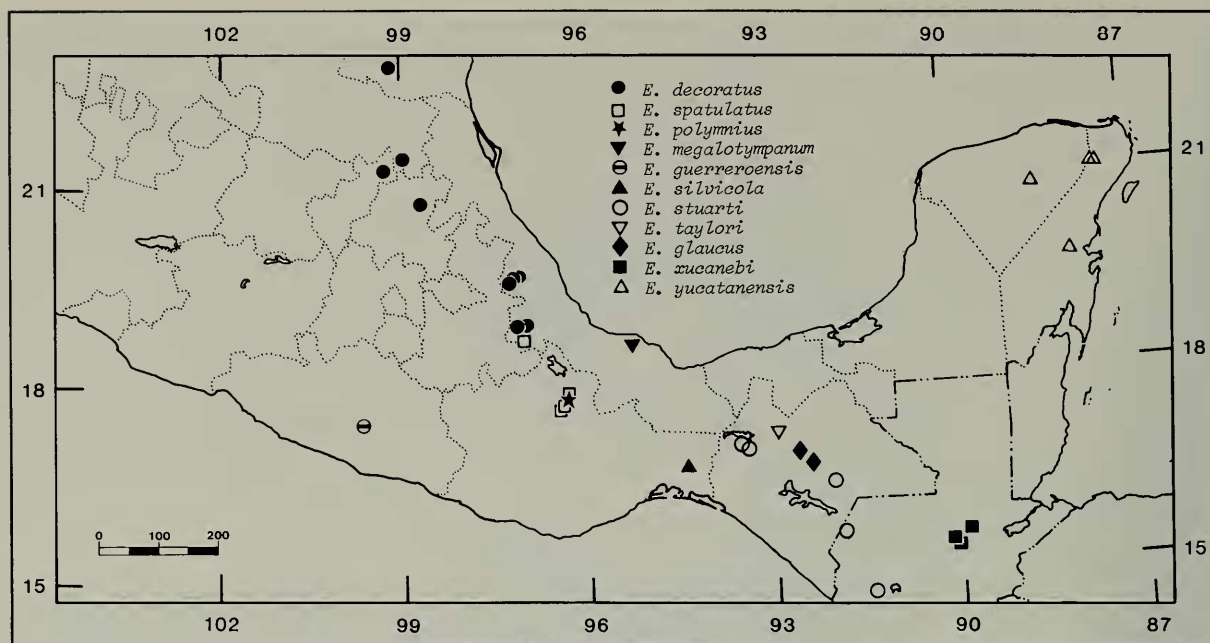


Fig. 4. Distributions of Mexican and Guatemalan species of *Eleutherodactylus* with greatly expanded, truncate digital pads on outer two fingers. In some instances, for multiple localities that are in close proximity, a single symbol is used. Localities for *E. alfredi*, ranging from east-central Veracruz to northwestern Guatemala, are not indicated.

blotch in the inguinal region. The color pattern of the anterior, dorsal, and posterior surfaces of the thighs is unremarkable in most species. Generally, there are about four dark transverse bands on a somewhat paler background, but the bands are often ill-defined and, at best, only moderately contrasting with the adjacent color. *Eleutherodactylus decoratus* has relatively sharply contrasting thigh bands, and, in *E. polymniae*, the bands are even more distinct (Fig. 2).

Both the holotype and paratype of *E. polymniae* were taken from the side of an extremely steep slope adjacent to a roadcut in virgin cloud forest. They were found between 23:00 h and 03:00 h. They were calling from vegetation; the holotype was about 3 m up in a tree, and the paratype was about 1 m above the ground. In both instances, a low fog reduced visibility to only a few meters and rain had fallen within the preceding 24 hr. Had we not fortuitously selected the site to make camp for the night, we most probably would not have discovered these frogs. We became aware of their presence

by their remarkably voluminous and varied calls. In fact, these tiny frogs are so loud that we at first mistakenly thought that their calls belonged to some large, night-calling bird, unknown to us. Field notes taken immediately after the capture of UTA A-23511 indicate calls include "a low growl, a low chuckle, single clicks, and a multinote 'laugh.' First two are given [relatively infrequently]; clicks (several) precede 'laugh.'"

Four other species of Mexican *Eleutherodactylus* with expanded toe pads are known to have vocal slits (Table 1), including *E. spatulatus*, with which *E. polymniae* may be sympatric; specimens of the former have been taken from the same hillside about 200 m above the type locality for *E. polymniae*. Some of the structures associated with vocalization are relatively large in *E. polymniae*. The vocal slits extend forward to a point about level with the midlength of the tongue in *E. polymniae*; in *E. spatulatus*, the slits extend only to about the posterior edge of the tongue. Perhaps more remarkable is the extent of development of the circular disc surrounding the glottis, which is

Table 1.—Comparison of selected morphological features in Mexican and Guatemalan species of *Eleutherodactylus* with the pads on the outer two digits greatly expanded. Measurements are in mm.

	Maximum size		Tympanum/eye		Vocal slits	Tarsal fold	Flank color pattern	Thigh color pattern
	Male	Female	Male	Female				
<i>E. alfredi</i>	45.0	—	—	—	Absent	Poorly developed or absent	Lacks sharply contrasting pattern	
<i>E. decoratus</i>	44.9	60.0	— ¹	0.59	Present	Faint to moderately distinct	Pale with distinctive dark brown mottling or vermiculations	
<i>E. glaucus</i>	31.7	—	0.81	—	Absent	Absent	Drab, mottled with brown	
<i>E. guerreroensis</i>	39.6	—	0.75	—	Present	Weakly developed	No obvious markings	
<i>E. megalotympanum</i>	—	39.5	—	0.60	—	Weakly developed ²	Drab, irregularly scattered dark pigment ³	
<i>E. polynniae</i>	19.7	—	0.32	—	Present	Absent	A large, irregular white blotch in groin region	
<i>E. silvicola</i>	—	40.2	—	0.59	—	Absent	Drab; cream colored with a few dark markings	
<i>E. spatulatus</i>	30.2	42.8	0.25–0.30	0.34–0.43	Present	Present	Irregularly mottled with dark brown	
<i>E. stuarti</i>	30.5	40.5	0.66–0.76	0.38–0.72 ⁴	Absent	Absent	Pale yellow with scattered melanophores	
<i>E. taylori</i>	26.0	—	0.75	—	Absent	Present	With darker patches	
<i>E. yucatanensis</i>	—	36.0	—	0.42–0.49	— ⁵	Poorly to moderately developed	No obvious markings	
<i>E. xucanebi</i>	32.8	46.0	0.65–0.70	0.51–0.60	Absent	Absent	Mottled with gray or brown	

¹ Martin (1958) reported that tympanum size in this species was not strikingly dimorphic between sexes.² No information regarding a tarsal fold was given in the original description (Shannon and Werler 1955); however, an illustration, which leaves much to be desired, appears to depict the presence of a fold.³ We have not examined the holotype and only known specimen of this species. The color pattern of the flanks and thighs was not given in the original description, and we have derived these data from a photograph (Fig. 1) in Shannon and Werler (1955).⁴ The higher figure in the range of variation is taken from Lynch (1967a) and seems unusually high. The lower figure is from a specimen (UTA A-24499) measured by us.⁵ Lynch (1965) reported that this species lacks vocal slits, but he examined only female specimens.

supported by the arytenoid cartilages. In *E. polymniae*, this disc is equal to 45% of the head width, whereas in male *E. spatulatus* it is only about 22% of the head width.

A number of species of the genus *Eleutherodactylus* occur on the mesic northern slopes of the Sierra Juárez, including several species apparently in the *alfredi* group. With *E. polymniae*, the number of species in this group known to inhabit the Sierra Juárez now stands at three. *Eleutherodactylus alfredi* is known from the lower portion of the range to elevations a little over 600 m, *E. polymniae* is known only from the type locality at 1420 m, and *E. spatulatus* has been collected at elevations from 1621 to 2235 m. Bogert (1969) found the latter species at approximately 1900 m in the Sierra Juárez. Although *E. spatulatus* has been collected to the north, as well as to the south, of the type locality of *E. polymniae* (Fig. 4), the northern record was from a hillside at 1621 m, the lowest elevational record for the species in the Sierra Juárez.

Eleutherodactylus bufonoides was described as belonging to the *alfredi* group from "above Vista Hermosa," in the Sierra Juárez (Lynch 1965). This name was subsequently synonymized with *E. spatulatus* (Lynch 1970b), an action with which we concur. The holotype of *E. bufonoides* is a male with a SVL of 29.7 mm and has none of the distinguishing pattern on the groin and thigh that characterizes *E. polymniae*. The specimen was collected at 1700 m, an elevation where we have encountered *E. spatulatus*.

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